WHAT DOES A PROJECT MANAGER NEED TO KNOW ABOUT THE SOILS PROGRAM AREA?

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R1

New York State Department of Transportation
Mario M. Cuomo, Governor *Franklin E. White, Commissioner*

Foreword

This handbook was prepared to provide project managers with a general idea of the role of the Regional Soils Engineer during the progression of a project. It is important to the efficient operation of the Soils program, and ultimately the timely delivery of the capital program, to have the Regional Soils Engineer involved in all phases of a project, including initiation, development, design and construction.

The text was written from the point of view of the project manager/project developer working in the Region. Those knowledgeable of the Soils program area may recognize that some aspects have been oversimplified. Because of the uniqueness of many situations in soils, it is necessary to make generalizations to enhance basic understanding.

Version R1 includes the following revisions:

Page 12, under **Soil Mechanics Bureau Provides**; Item 10 deleted and replaced with the following:

"10. Provide recommendations for Foundation Design Report."

Page 17, Region 7; Bill Whalen replaced by Scott Docteur.

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Table of Contents

Foreword i

Introduction 1

Project Initiation 3

Starting the Project 5

Project Scoping 7

Preliminary Design (Phase I - IV) 9

Detail Design (Phase V) 11

PS&E (Phase VI) and Letting 13

Construction 15

Summary 17

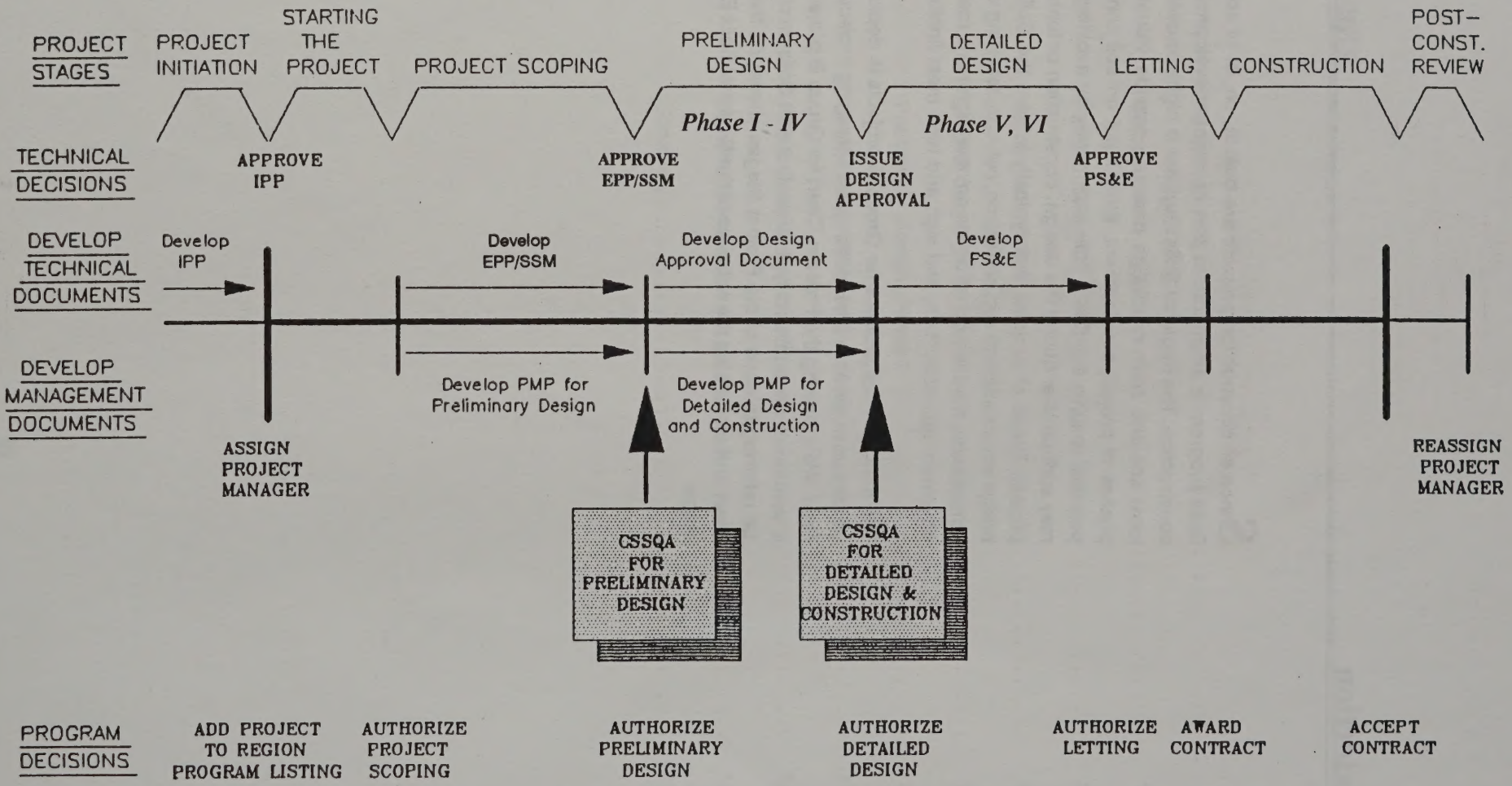
Introduction

Since all construction projects are built in, on, or of soil and rock, the Soils program is an important part of project development, design and construction. The Regional Soils Engineer is highly knowledgeable about local soil and rock conditions and can provide valuable input at all phases of project development. Early input on soil conditions has the potential to save significant time and money by avoiding problems that may surface later during the design, construction or functional life of the project. Types of projects that typically involve the Soils Program are: bridge construction or reconstruction, culverts, retaining walls, rock slope remediation, roadway construction on new alignment, roadway widening, pavement reconstruction, and sign and high mast lighting foundations.

The management process for Group B projects is depicted in Figure 1, which was taken from the *Procedure for Managing Projects, Third Working Draft*. We are using the Process Chart for Group B projects because it is a commonly encountered type of project with Soils involvement. We will be referring to each of the Project Stages shown on the first line of the chart and discussing the activities of the Regional Soils Engineer at each stage.

Figure 1

MANAGEMENT PROCESS FOR GROUP B PROJECTS



Project Initiation

The Regional Soils Engineer should first be involved in a project right at project initiation, during the preparation of the IPP. Although information about a project is very general at this point, a quick call to the Regional Soils Engineer can give the IPP preparer a rough idea if difficult soil conditions are present at the site and if they will influence the project. Figure 2 shows the project level activities with which the Regional Soils Engineer is involved and services that can be provided at the Project Initiation stage of a project.

The information available from the Regional Soils Engineer at this point is general, such as: this is a soft soil location, or rock may be shallow, or water may be a problem. An early alert will provide the opportunity to recognize that additional study or special features may be needed, and early consideration may avoid unexpected additions or changes later.

The Regional Soils Engineer can also provide information on general cost and schedule estimates for soils related items. The Soil Mechanics Bureau has extensive records of costs and resource requirements for various project types, and this base of information is used to develop unit costs, typical schedules and resource requirements for soils activities.

Regional Soils Engineers do their best to track projects in the Region's program using PAC II reports. However, on many projects it is difficult to determine the potential for soils involvement using the limited description provided in the reports. Therefore, it is important that Regional Soils Engineers continue to receive a copy of all IPP's, unless of course it is obvious that there is no soils involvement in the project (bridge painting, for example). The Regional Soils Engineer can then, upon request, provide an initial assessment of the extent of soils involvement.

Figure 2

SOILS PROGRAM IN HIGHWAY PROJECT DEVELOPMENT

PROJECT INITIATION			
ORGANIZATION		**PROVIDES:** Regional Soils Engineer with brief project/problem description and general location.	**RECEIVES:** Verbal description of soils and foundation conditions which could affect scope, generic costs or schedule.
REGION PLANNING AND PROGRAM MGT GROUP			
SOILS PROGRAM	**REGIONAL SOILS SECTION**	**PROVIDES PRELIMINARY SOILS INFORMATION:** Based on knowledge of and experience with soil and rock conditions in the vicinity of the proposed project, provides verbal input to preliminary estimates in the IPP. Provides generic costs (i.e. $/sq ft ($/sq m) or $/mi ($/km)), preliminary schedule and need for special technical activities. Alerts the IPP preparer to potential soils problems.	
	SOIL MECHANICS BUREAU	**PROVIDES:** Technical assistance when necessary.	

Starting the Project

During this stage of the project, the project manager is developing the project management plan for the scoping stage of project development. Based on the information contained in the approved IPP, the Regional Soils Engineer will make a preliminary determination of the level of involvement of the Soils program. If it looks like there will be Soils involvement in the project, the Regional Soils Engineer will inform the project manager or project developer that a Soils representative should be involved in the scoping activities.

Since it is still early in project development, the level of detail provided by the Regional Soils Engineer for input to the project management plan will be broad, and rather than try to estimate specific resource requirements or schedules, the Regional Soils Engineer will probably be looking only for unusual conditions or major activities that would require significant resources. Generally, there is enough flexibility in the Soils program to accommodate most routine activities. Large or unusual activities, however, may require some adjustments.

Figure 3

SOILS PROGRAM IN HIGHWAY PROJECT DEVELOPMENT

STARTING THE PROJECT			
ORGANIZATION		**PROVIDES:** Regional Soils Engineer with draft of management strategy and objectives of the project; tentative identification of functional areas to be involved.	**RECEIVES:** feedback from the Regional Soils Engineer on activities, key products, final event, preliminary schedule and resource requirements for project scoping.
REGION PLANNING AND PROGRAM MGT GROUP			
SOILS PROGRAM	**REGIONAL SOILS SECTION**	**PROVIDES INPUT ON:** • preliminary schedule for project scoping • availability of resources • desire to participate in scoping	
	SOIL MECHANICS BUREAU	**PROVIDES:** information on availability of Bureau resources; technical assistance when necessary.	

Project Scoping

During the Project Scoping stage, the project developer maintains close contact with the Regional Soils Engineer as project details are formulated and refined. Based on a corridor location plan or project description provided by the project developer, a field inspection over the project limits will be conducted and surveys of the performance of nearby facilities will be accomplished. A review of the soil maps, air photos and previous subsurface explorations will also be undertaken. The Regional Soils Section, with input and assistance when needed from the Soil Mechanics Bureau, may prepare a Preliminary Soils Report, or depending on the project, a more elaborate Terrain Reconnaissance Report. Occasionally, on very large, complex projects, preliminary explorations may be progressed to assess the magnitude of a problem.

The project scoping meeting is held at this stage, at which all involved units have an opportunity for input into the objectives of the project. The Regional Soils Engineer will attend and provide information on soil conditions and other possible concerns that should be considered during the project's design. Reports to date from Regional Soils Engineers indicate that the time spent in a well-conducted scoping meeting is worthwhile and effective.

For some projects, it is necessary to have the soil explorations done by contract. There are occasions when the workload exceeds the Region's resources, or hazardous materials are present at the site. (All drilling of hazardous materials is done by contract, as is nearly all Region 11 drilling.) Project managers and project developers must recognize very early in project development when contract drilling will be required, as it may take up to a year, and sometimes two years, to obtain the necessary soils information to progress the design. If a drilling contract is required, activity to assemble and let the contract must start as soon as possible using the best available information.

The project manager will be preparing the project management plan and CSSQA for preliminary design during the scoping stage, assuming a Group B (or C) project. Soils will have input to the development of the CSSQA. However, except for projects that are predominantly Soils activities (such as a slope stabilization project), Soils will not be a signer of the CSSQA. Typically, Soils activities will fall under the job management plan for structure design or highway design activities. Project managers should contact the Regional Soils Engineer for projects where it is necessary to identify a main office signer for a CSSQA.

Figure 4

SOILS PROGRAM IN HIGHWAY PROJECT DEVELOPMENT

PROJECT SCOPING			
ORGANIZATION		**PROVIDES:** Regional Soils Engineer with: • Corridor Location Plan, Contour Plan and/or Project Description • Project schedule data	**RECEIVES:** Terrain Reconnaissance Report or Preliminary Soils Report
REGION PLANNING AND PROGRAM MGT GROUP			
SOILS PROGRAM	**REGIONAL SOILS SECTION**	**PREPARES PRELIMINARY SOILS REPORT** Identifies major soil and rock deposits on project or in each corridor, evaluate engineering significance of major deposits that could affect highway performance, construction costs and schedules. Occasionally, right-of-way considerations may be influenced by soil and rock deposits. Will be in close communication with the project developer as project details evolve. 1. Field Reconnaissance a. Performance of nearby facilities b. Evaluation of existing pavement and shoulder performance and determination of need for drainage improvements to existing facilities. 2. Review of previous subsurface explorations 3. Preliminary subsurface exploration if needed for major problem evaluation 4. Provides input to project management process by: a. participating in scoping meeting b. providing comments on scoping document c. providing input to project management plan for design	
	SOIL MECHANICS BUREAU	**PROVIDES:** technical assistance to Region where required. 1. Terrain Reconnaissance Reports for major projects on new location when requested by Region. 2. Assistance to Regional Soils Section in preparation of reports. 3. Survey of existing soil data a. Agricultural soils maps b. Geologic literature c. Analysis of air photos	

Preliminary Design (Phase I - IV)

As the alternative designs are identified and developed through the preliminary design stage, the Regional Soils Engineer is available to provide input on the characteristics of major soil and rock deposits for each of the potential locations. The Region Design Group will provide the Regional Soils Engineer with plans, profiles and typical sections of each of the alternative designs, and the Regional Soils Engineer will provide a soils report or update the Preliminary Soils Report, if necessary, for inclusion in the Design Approval Document. *The Regional Soils Engineer is depending on the Region Design Group and the project manager to provide him with the project information when it becomes available.* It is difficult for the Regional Soils Engineer to know on every project when this information is or should be available.

Under normal circumstances and with sufficient lead time, most drilling work is performed during the early part of the Preliminary Design stage. On occasion, some Regions are forced to begin drilling before Preliminary Design because of tight schedules and heavy workloads. This undesirable situation can and should be avoided by good early communication and proper project scheduling.

Once drilling is complete, boring logs are prepared by the Region Soils Section. Soil descriptions, moisture contents, penetration resistance data, groundwater level and other important information is shown on the boring logs and is used for foundation design and other activities that involve subsurface soils. The Regional Soils Engineer must be given sufficient time to complete the drilling operation and prepare the boring logs so that the logs can be included with the structure site data submitted to the bridge office for bridge projects, or to designers in the Soil Mechanics Bureau or elsewhere for other soils projects.

Also needing attention during Preliminary Design is the potential for having a soils recommendation that will affect right-of-way. Soils activities such as earth and rock cuts, the need for stabilization berms, permanent or temporary ground anchors, etc., may require additional right-of-way, and the acquisition of right-of-way may require substantial lead time.

Soils will have input to the development of the CSSQ agreement for Detailed Design and Construction, which is being developed by the project manager at this time. The Regional Soils Engineer will provide liaison with the Soil Mechanics Bureau and will transmit information on the availability of resources and a schedule for the completion of the necessary soils information.

Figure 5

SOILS PROGRAM IN HIGHWAY PROJECT DEVELOPMENT

PRELIMINARY DESIGN (PHASE I-IV)			
ORGANIZATION		**PROVIDES:** Regional Soils Engineer with Plans, profiles and typical sections of alternate designs	**RECEIVES:** Soils Report for inclusion in Design Approval Document (or updates previously provided report if necessary).
REGION DESIGN GROUP			
SOILS PROGRAM	**REGIONAL SOILS SECTION**	**PREPARES SOILS REPORT FOR DESIGN APPROVAL DOCUMENT** 1. Identifies major soil and rock deposits for each alternate design and prepare subsurface exploration plan. a) Field Reconnaissance - performance of existing highway and nearby facilities. b) Review of existing soil data c) Preliminary subsurface explorations in major problem areas for feasibility studies and evaluation of economic and environmental considerations. (Preliminary explorations are not normally done in Region 11 because of drilling by contract.) 2. Determines engineering significance of major deposits that could affect highway performance, construction costs; influence of soil and rock deposits on location, alignment, and right-of-way considerations, and appearance of completed project. 3. Evaluates existing pavement and shoulder structure and foundation conditions in conjunction with the Regional Materials Engineer for projects requiring a pavement evaluation.	
	SOIL MECHANICS BUREAU	**PROVIDES:** special equipment for subsurface exploration, technical advisory service, and assistance in preparation of drilling contracts.	

Detail Design (Phase V)

Once the final alternative design is selected and design approval is given by the Regional Director, the Region Design Group provides the Regional Soils Engineer with plans, profiles and typical sections (Advance Detail Plans), any changes to the plans, and the project schedule data. The Regional Soils Section and the Soil Mechanics Bureau work together to provide the detailed soils and foundation information to the designers.

On bridge projects where the structure is designed at the main office, there is a communication circle involving the Region Design job manager, Main Office Structures, Main Office Soils and the project manager which must be kept open all the way around. The Soil Mechanics Bureau and the Structures Design and Construction Division work together to produce the Foundation Design Report (FDR) for the bridge designer. Since the design recommendations contained in the FDR could significantly affect a project's cost, schedule and even scope, project managers may want to include the development of the FDR in the project management plan. This will ensure that the FDR is recognized as a potential source of changes in a project's CSSQA and that if a change in the foundation design is required, or unusual or costly foundation treatments are recommended, then the information is properly communicated throughout the chain of project participants.

Other details provided to the designer during Detail Design, depending on the project, are the information necessary to prepare plans and quantity and cost estimates for earthwork items, recommendations for treatment of embankment foundation problems and cut slopes, subsurface drainage, unsuitable material removal, undercutting unstable soils, granular construction lifts, granular slope protection treatment, soil parameters for sheeting design and vertical and lateral earth pressure, specific substructure foundation design, special earthwork specifications, and earthwork considerations for bank and channel protection, to name a few. Figure 6, Detail Design (Phase V), provides further detail.

Figure 6

SOILS PROGRAM IN HIGHWAY PROJECT DEVELOPMENT

DETAIL DESIGN (PHASE V)			
ORGANIZATION		**PROVIDES:** Regional Soils Engineer with: • Plans, profiles and generalized cross sections (ADP) • All plan and profile changes • Project schedule data	**RECEIVES:** Soils Report for Advance Detail Plans (or updates previously provided report if necessary).
REGION DESIGN GROUP			
SOILS PROGRAM	**REGIONAL SOILS SECTION**	**PREPARES SOILS REPORT FOR ADVANCE DETAIL PLANS** 1. Provides designers with recommendations for necessary information to prepare plans and quantity and cost estimates for earthwork items. 2. Confirms location, alignment and right-of-way treatments based on soil and rock conditions. 3. Provides recommendations for treatment of embankment foundation problems and cut slopes. 4. Determines that sufficient subsurface explorations have been progressed. 5. Provides soil parameters for sheeting design, recharge basins. 5. Provides special earthwork specifications and typical sections, if required. 6. Provides accurate location of all subsurface explorations; coordinate data for plotting on plans.	
	SOIL MECHANICS BUREAU	**PROVIDES:** technical services and assistance to Regions when required, such as: 1. Geophysical Surveys - seismic and resistivity explorations to determine depth to rock surface, water level, etc., for cut slope design and earth work quantity estimates. 2. Rock Outcrop Mapping - preparation of rock outcrop map to aid designers in determination of rock surface for earthwork quantity estimates. 3. Geologic Surveys - rock cut slopes - recommendation for rock cut slope treatment. 4. Roadway Foundation Design - recommendation for treatment of embankment foundation soils in critical areas. 5. Earth Cut Slope Design - recommendation in critical soil and groundwater seepage areas. 6. Retaining walls designed by Regions - recommendations for vertical and lateral earth pressure considerations. 7. Pipe Design - unusual problems involving earth pressures and jacking procedures. 8. Channel Slope Protection - problems involving stone fill, rip rap, gabions, stapods; except in the vicinity of structures. 9. Provide data for recharge basin design. 10. Provide recommendations for Foundation Design Report. 11. Provide Boring Location Plan and Subsurface Profile. 12. Special pavement design.	

PS&E (Phase VI) and Letting

As the design of the project nears completion and letting, the Regional Soils Engineer and the Soil Mechanics Bureau coordinate the soils input to the PS&E. The Soil Mechanics Bureau prepares the Boring Location Plan and Subsurface Profile for structure plans, which is included in the project plans. Detailed recommendations of previously reported treatments and special earthwork specifications are confirmed. Upon request of Regional Design, a package of all soils data for examination by bidders, including special notes, boring logs, special specifications, and any test data from the Soil Mechanics Bureau is assembled and forwarded to the Region for inclusion in the final bid package.

It is important that the Design job manager notify the Regional Soils Engineer when final plans are available for review so that the soils aspects can be checked for accuracy and completeness. Since the plan review function has been decentralized to the Region, the plans are not reliably available for review at the Main Office. Also, there has traditionally been the problem of the highway plans and bridge plans not being available for a composite review until final plan review. A review for compatibility and consistency between the two sets of plans is important at this stage.

The review by the Regional Soils Engineer is critical to quality control, and it is important for the project manager to include the quality review in the project management plan.

Figure 7

SOILS PROGRAM IN HIGHWAY PROJECT DEVELOPMENT

PS&E (PHASE VI) / LETTING			
ORGANIZATION			
REGION DESIGN GROUP			**RECEIVES:** Final Soils Report (or updates previously provided report if necessary).
SOILS PROGRAM	**REGIONAL SOILS SECTION**	**PREPARES SOILS REPORT FOR FINAL P.S.& E.** Provides package of all soils data for examination by bidders, such as boring logs, test results, rock outcrop maps, Terrain Reconnaissance Report, and any other project information available from the Soil Mechanics Bureau.	
	SOIL MECHANICS BUREAU	**PROVIDES:** technical services and technical assistance to Regions when required, any lab test result summaries, special reports prepared by the Soil Mechanics Bureau.	

Construction

Soils involvement in many projects continues into construction. The Region Construction Group may request the Regional Soils Engineer attend or coordinate a pre-construction soils meeting, pre-blasting meeting, sampling and testing of granular material, determination of the quality of stone fill and rip rap, or earthwork inspector training. The Regional Soils Engineer is available to provide support in the field for situations that arise during construction, such as earthwork control problems or recommendations for the depth of undercuts in unstable soils.

The Soil Mechanics Bureau's construction support involves activities such as technical assistance; sampling and testing of granular materials; wave equation analysis to determine pile driving criteria and acceptability of driving equipment; and dynamic pile load tests for verification of pile lengths, quality control and trouble shooting. Rock bolt operations, grouting operations, anchors, tiedowns, instrumentation, vibration monitoring, order-on-contract review, and other services are also available.

Of course, the Regional Soils Engineer will be available to provide input and follow up support to the project manager during project close-out and the post-construction review.

Figure 8

SOILS PROGRAM IN HIGHWAY PROJECT DEVELOPMENT

CONSTRUCTION			
ORGANIZATION		**REQUESTS:** Regional Soils Engineer attend or provide: • Pre-construction soils meeting • Pre-blasting meeting • Sampling and testing granular material • Quality of stone fill and rip rap • Earthwork inspector training and equipment (State inspected contracts) • Soils construction advice	**RECEIVES:** requested data, training and equipment
REGION CONSTRUCTION GROUP			
SOILS PROGRAM	**REGIONAL SOILS SECTION**	**REQUESTS:** technical assistance when required **PROVIDES:** requested data, service, training and equipment; soils sample test results; reports	
	SOIL MECHANICS BUREAU	**PROVIDES:** Test data: • Subbase, gravel, underdrain filter • Compaction control curves • Topsoil Project testing equipment and supplies (for State inspected contracts) Technical assistance for constructing soils related items.	Services: • Inspections, reports • Stone filling/rip-rap evaluation • Presplitting & rock excavation inspection • Pre-blasting meeting • Water well installation • Instrumentation • Vibration monitoring • Field construction problem recommendations • Structure pile length analysis • Pile driving equipment analysis • Rock foundation inspection • Order-on-Contract review • Pre-blasting meeting

Summary

The Soils Program is organized with the Regional Soils Engineer as the focal point. Additional details on the functions and activities of the Regional Soils Unit and the Soil Mechanics Bureau can be found in the *Program and Project Management Guide for the Soils Program Area, Technical Services Division Services Directory,* and *Regional Services Directory,* all of which are available from the Regional Soils Engineer or the Soil Mechanics Bureau.

In all phases of project development, it is important that contacts with the Regional Soils Engineer be initiated by the project manager, project developer or designer to ensure that communication is complete and timely. It is also important that soils activities, particularly drilling and soils recommendations that affect right-of-way, be given adequate consideration in the project schedule as many of these activities require a significant amount of lead time.

Listed below are the names and phone numbers of the Regional Soils Engineer in each Region. They are your contact for "one stop shopping" and are available to help you and answer your questions.

Region 1	Wayne Johnson	(518) 454-0393
Region 2	Joe LiBritz	(315) 793-2484
Region 3	Mark Cregg	(315) 469-3236
Region 4	Rich Kiehle	(716) 272-3396
Region 5	Joe Zieziula	(716) 649-2808
Region 6	Walt Gronski	(607) 324-8539
Region 7	Scott Docteur	(315) 785-7470
Region 8	Herbie Litts	(914) 431-5753
Region 9	Dan Coleman	(607) 773-7845
Region 10	Roy Reissig	(516) 360-6177
Region 11	S. Srinivasan (Rini)	(718) 482-4511

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